



Infrared circuits

1. Infrared transmitter circuit

5 mm infrared transmitting LED

5MM EMITTING DIODE Looks like a 5 mm LED & has a blue transparent lens.

Specifications:-

Forward Current (I_f): 50mA max –

Peak forward current (I_p): 1.2A-

Forward Voltage (V_F): 1.2V @ 20mA

Reverse Voltage (V_R): 5V max-

Power Dissipation (P_d): 100mW max

Viewing Angle: 30°- Peak Spectral

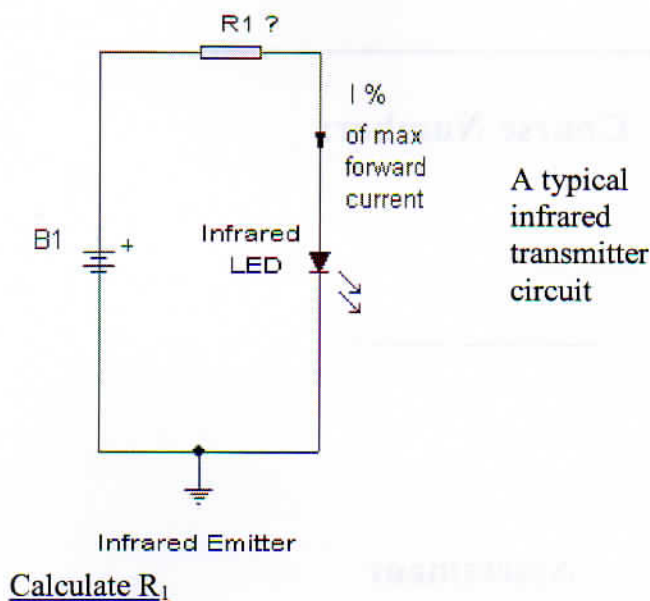
Wavelength(IR): 940nm @ 20mA *

Spectral Bandwidth (DI): 50nm@20mA-

Material: GaAs



Data set to be used : _____



Values for calculation		
	B_1	$I \%$
1	3	40
2	4.5	50
3	5	60
4	6	40
5	9	50
6	12	60
7	3	60
8	4.5	50
9	5	40
10	9	60
11	12	50
12	3	40
13	4.5	70
14	5	50
15	6	60
16	9	70
17	12	40
18	3	70
19	6	50
20	9	40



If a stronger infrared is required, a current larger than the maximum current can be used with pulse width modulation. Calculate the ratio of on/off time for the pulse current if the peak forward current is to be used.

Calculation:

Infrared receiver circuit

Infrared phototransistor

Looks like a 5mm LED & has a clear transparent lens

Specifications:-

NPN

Collector-to-Emitter Breakdown voltage: 30V

Emitter-to-Collector Breakdown voltage: 5V

Collector-to-Emitter Saturation voltage: 0.8V Max

Collector Dark current: 100nA@10V(Vce)

Rise and Fall time: 3uS @ 5V(Vce)

Breakdown voltage: 5V

Power Dissipation: 100mW max

Collector: Short Leg

Emitter: Long Leg



Draw an infrared receiver circuit which operates in conjunction with the transmitter circuit in question 1. Specify values for all components used. The receiver circuit outputs a high voltage (2.5V to 5V) when there is no infrared light and it outputs a low voltage (0 to 0.8V) when the receiver sees infrared light.

(The emitter/ receiver couple in this exercise could be used as a sensor on a robot car)



What is the advantage of helical gears over spur gears?

What mechanical problem is faced by helical gears?

How is the mechanical problem in the above questions be solved.

Suggest the type of gears to be used used in the following situations

- (a) When the input and output shafts are parallel
- (b) When the input and output shafts are at right angle to each other and on the same plane
- (c) When the input and output shafts are at right angle to each other but **not** on the same plane



A and D are single spur gears

B and C are compound spur gears

	Number of teeth				
A	16	18	20	22	24
B1	8	10	12	14	16
B2	20	22	24	26	28
C1	8	10	12	14	16
C2	20	22	24	26	28
D	6	8	10	12	14

Ni	950	1450	1950	2250	2950
Ti	5	7	9	11	13
η	65	70	75	80	85

Ni = input speed in RPM
Ti = input torque in Nm
H = efficiency of the gear train in %

Find the following:

- Gear ratio
- Mechanical Advantage
- Output speed in RPM
- Output torque in Nm